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(56) Documents Cited
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(54) Steering control stick with a finger-actuable accelerator

(57) An operating element arrangement, suitable for controlling the longitudinal and transverse movement of a motor vehicle, comprises a steering control stick 1 in which a finger-actuable regulating part 4, for controlling the vehicle acceleration, is integrated. A lateral deflection or force which is exerted on the control stick 1 is detected by a sensor in order to control the steering angle of the vehicle. An actuator may be used to exert a reaction force or deflection on the control stick 1, as feedback for the driver. The finger-actuable regulating part 4 may be in the form of a pivotable finger, a regulating wheel, a sliding element or a pressure sensor. Buttons 2,3a,3b,6 on the control stick 1 activate a horn, direction indicators and a speed-regulating device respectively. Braking operations are controlled by a foot-actuable force sensor (7, Fig 3).

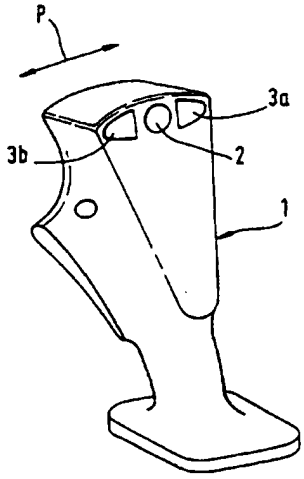

Fig. 1

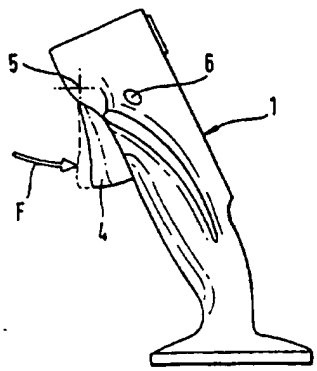

Fig. 2

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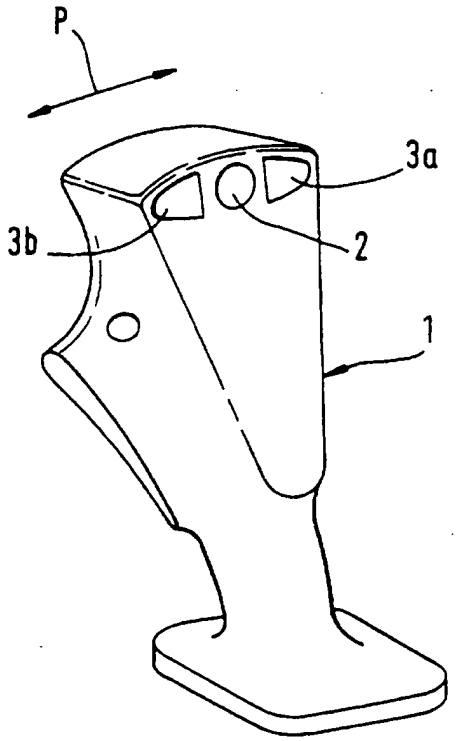

Fig. 1

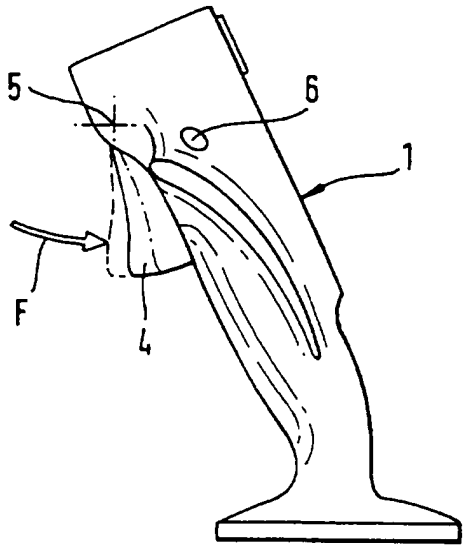

Fig. 2

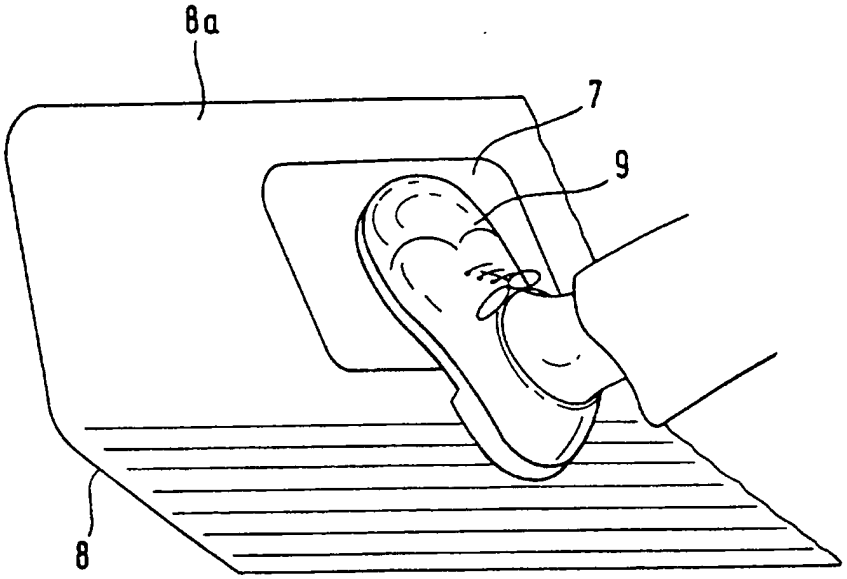

Fig. 3

Operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle

The invention relates to an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, with a foot-actuable regulating part for activating braking operations.

In conventional operating arrangements of this type, such as are used, for example, in automobiles, this foot-actuable regulating part is formed by a brake pedal, and a likewise foot-actuable accelerator or driving pedal is provided for activating acceleration operations, whilst the control of transverse movement, that is to say the steering of the vehicle, is carried out via a steering wheel. The paper by P. Bränneby et al., Improved Active and Passive Safety by Using Active Lateral Dynamic Control and an Unconventional Steering Unit", 13th International Technical Conference on Experimental Safety Vehicles, 4th to 7th November 1991, Proceedings Vol. 1, page 224, proposes, as an alternative to the conventional steering wheel, an operating lever which is arranged, for example, on the centre tunnel of the vehicle.

Furthermore, it is known to provide a common operating element for controlling the longitudinal and transverse dynamics of a motor vehicle, preferably the longitudinal dynamics being controlled by actuating the operating element in the longitudinal direction of the vehicle and the transverse dynamics being controlled by actuating the operating element in the transverse direction, in particular as a rotational movement corresponding to the conventional steering wheel. Such an operating element is disclosed in Patent Specification US 3,022,850 in the form of a control stick which is mounted in a frame so as to be pivotable about a horizontal transverse axis, the frame, in turn, being rotatable about a horizontal longitudinal axis. A further operating element of this type, which is mentioned in the paper by H. Bubb, Arbeitsplatz Fahrer - Eine

ergonomische Studie [Driver's area - an ergonomic study], Automobil-Industrie [Automobile Industry] 3/85, page 265, contains two mechanically interconnected plate-like handles which are located closely next to one another and which are attached to one end of a bar which is guided movably on the vehicle centre console. The longitudinal dynamics of the vehicle are controlled by displacing the bar in the longitudinal direction of the vehicle, whilst the transverse dynamics are influenced by rotating the two plate-like handles in the transverse plane of the vehicle.

German Patent Application 195 48 717.6, which is not a prior publication, discloses an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, the said arrangement comprising two operating elements which can be actuated independently of one another and each of which is intended for controlling the longitudinal and transverse movements and is preferably designed as a manually actuable control stick. Coupling the two operating elements electronically prevents command collisions, for example due to the additive superposition of the control command signals, due to the manual passive switching of one operating element in each case or due to the assignment of different priorities for the two operating elements.

The published application DE 28 41 786 A1 discloses an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, the said arrangement containing, for controlling longitudinal acceleration operations, a conventional, foot-actuable accelerator pedal and a manually actuable actuating wheel which is coupled mechanically to the latter and which is arranged on a conventional steering wheel, serving for the control of transverse movement, so as to be rotatable together with the said steering wheel and displaceable axially relative to it. The purpose of this arrangement is also to enable the disabled to drive motor vehicles having a conventional pedal assembly by making the pedal controls

capable of being actuated by hand.

In an arrangement known from the published application DE 43 01 292 A1, there is provided, in addition to a conventional steering wheel serving for the control of transverse movement, a manually actuable brake knob coupled to a conventional brake pedal and intended for activating the vehicle brake. Furthermore, the arrangement contains a device for regulating the longitudinal speed, and the desired speed value can be decremented merely by touching the brake knob and can be incremented by actuating push buttons provided in the steering wheel. In a standard operating mode without speed regulation, acceleration operations are controlled via a conventional, foot-actuable accelerator pedal.

The Patent Specification US 5,309,361 discloses a foot-actuable operating element arrangement for controlling the longitudinal movement of a vehicle, in which the brake pedal and accelerator pedal are designed as hemispherical force sensor elements which give way to an external pressure actuation force.

The present invention seeks to provide an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle with a high level of driving and operating comfort.

According to the present invention there is provided an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, with a foot-actuable regulating part for the control of braking operations, the arrangement including a manually actuably arranged regulating part in the form of a steering control stick which, for controlling the transverse movement of the vehicle, can be subjected to actuating forces acting in the transverse direction of the vehicle and into which a finger-actuable regulating part for controlling acceleration operations is integrated.

In this arrangement, a regulating part which is manually actuable in the transverse direction of the vehicle

and is in the form of a steering control stick serves for controlling the transverse movement of the vehicle, that is to say for steering the vehicle. Integrated into this manually actuable regulating part is a finger-actuable regulating part which serves for controlling acceleration operations and which consequently performs the function of a conventional, foot-actuable accelerator pedal. In comparison with conventional arrangements having a steering wheel and a brake and accelerator pedal assembly, numerous advantages are afforded. Thus, active safety with regard to the longitudinal dynamics is improved, in that, for alternate acceleration and braking, the foot no longer has to be changed over between the accelerator pedal and brake pedal. Instead, the activation of acceleration operations is separated from the activation of braking operations spatially and, as regards the operating mode, distinctly. Moreover, braking operations can be initiated substantially more quickly. Furthermore, dispensing with the accelerator pedal does away with the risk of actuating the wrong pedal. Further, operating safety and operating comfort are increased by the possibility of driving the vehicle more intuitively and of a more comfortable body posture. By dispensing with the accelerator pedal and with the conventional steering wheel, free spaces occur in the driver's seat region and may be utilized for the more advantageous placing of other instruments in the dashboard region. Moreover, in the case of a laterally arranged steering control stick, the arms need not be held stretched so far forwards as in the case of the conventional steering wheel. In addition, dispensing with the accelerator pedal and with the steering wheel improves passive safety, since, in the event of a rear-end collision, the risks of injury associated with these elements does not arise. Furthermore, the omission of the conventional steering wheel and accelerator pedal may be utilized for the purpose of shortening the vehicle, whilst at the same time ensuring the same amount of available space, and of providing more

convenient possibilities for getting into the vehicle.

In comparison with arrangements having an operating element which serves for controlling both longitudinal and transverse dynamics and, for this purpose, can be subjected to an associated actuating force in the longitudinal and transverse directions, the advantage of the present operating element arrangement is that only the transverse movement of the vehicle is influenced by the force exerted on the manually actuable regulating part, without there being any possibility of an actuating force component in the longitudinal direction of the vehicle inadvertently having an undesired influence on the longitudinal dynamics of the vehicle at the same time. On the contrary, the vehicle driver's hand actuating the regulating part may be supported on this regulating part in the longitudinal direction of the vehicle.

In a preferred arrangement, the steering control stick is arranged to the side of a driver's seat. If required, a steering control stick may be provided on both sides of the driver's seat, in which case the two sticks can be operated in parallel, suitable measures ensuring that no command collisions occur.

In a development of the invention the finger-actuable regulating part integrated into the manually actuated regulating part comprises a regulating lever, regulating wheel, sliding element or pressure sensor.

A preferred form of operating element arrangement contains, as a foot-actuable regulating part for the control of braking operations, a large-area force sensor element which is arranged in the driver's seat floor region, that is to say approximately where the brake pedal is conventionally located. The design as a large-area force sensor element instead of a pedal improves passive safety, since, in this way, not only the accelerator pedal, but also the brake pedal, and consequently the risks of injury associated with this pedal assembly, are absent.

A preferred embodiment of the invention is

illustrated in the drawings and is described below. In the drawings:

Figure 1 shows a diagrammatic perspective view of a manually actuable steering control stick with an integrated finger-actuable accelerator steering finger of an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle,

Figure 2 shows a diagrammatic perspective view of the steering control stick of Figure 1 in another viewing direction, and

Figure 3 shows a diagrammatic perspective view of the driver's seat foot region, in which a foot-actuable regulating part of the operating element arrangement having the steering control stick of Figures 1 and 2 is arranged.

Figures 1 and 2 show a manually actuable regulating part in the form of a steering control stick 1 for controlling the transverse movement of a motor vehicle, that is to say for steering the latter, the said control stick forming a component of an operating element arrangement for controlling the longitudinal and transverse movements of the motor vehicle. The steering control stick 1 is connected to the vehicle body in a way not shown in any more detail, such that it initiates steering operations under the influence of an actuating force acting in the transverse direction of the vehicle, whereas it does not give way to forces in the longitudinal direction of the vehicle and these forces also do not initiate any control activities. The vehicle driver's hand may thereby be supported on the steering control stick 1 in the longitudinal direction of the vehicle. This restriction of the function of the steering control stick 1 to the transverse direction of actuation is illustrated in Figure 1 by means of a double arrow P, which symbolizes deflections or operating forces in the transverse direction of the vehicle.

For the control of transverse movement, the

steering control stick may, if required, be designed as a passive, isometric or active regulating part. In the case of a passive design, the steering control stick 1 is connected to the vehicle body so as to be movable in the transverse direction of the vehicle. A movement of the regulating part to the left then initiates a corresponding steering movement for the vehicle to the left, whilst, similarly, a movement of the regulating part to the right leads to a steering lock to the right. The movement of the regulating part may be a transverse movement or a pivoting movement. In the case of an isometric design of the regulating part, the steering control stick 1 remains fixed, and an associated force sensor assembly senses the transverse actuating force acting on it. A following control unit of the operating element arrangement then sets the steering angle associated with the sensed actuating force. In the case of an active design of the regulating part, the setting of the steering angle takes place as a function of the transverse actuating force exerted or of the deflection, and, in addition, automatic deflection of the steering control stick 1 or subjecting the latter to reaction force takes place as a function of the respective actual steering-angle value or other actual vehicle variables, as feedback information which can be detected by the driver.

It can be seen in Figure 1 that a button 2 for activating a horn and, on appropriate sides, two direction indicator actuating buttons 3a, 3b are integrated as additional operating functions on one side of the steering control stick 1. These buttons 2, 3a, 3b can easily be operated by the driver, for example with the thumb of the hand grasping the steering control stick 1, without the steering control stick 1 having to be released for this purpose.

Furthermore, as can be seen in more detail from Figure 2, a finger-actuable regulating part in the form of a accelerator steering finger 4 is integrated into the steering control stick 1. The accelerator steering finger 4

can easily be actuated by the driver with one or more fingers of the hand grasping the steering control stick 1, the said accelerator steering finger being pivotable on the steering control stick 1 about a pivot axis 5. As indicated in Figure 2, the accelerator steering finger 4 is deflected under the effect of a corresponding actuating force F, this being recorded by an associated sensor assembly [not shown]. A control unit of the operating element arrangement, the said control unit following the sensor assembly, converts the sensed movement of the accelerator steering finger 4 into a corresponding activation of a vehicle acceleration operation. For this purpose, depending on the system design, a specific throttle-flap setting or a specific desired acceleration value may correspond to the respective actuating travel of the accelerator steering finger. In the latter case, the vehicle maintains the instantaneous speed if no actuating force is exerted on the accelerator steering finger 4, whereas it accelerates to the maximum extent if the lever 4 is deflected to the maximum extent. The accelerator steering finger 4 allows the vehicle acceleration to be adjusted in comparatively finely graduated steps by finger actuation. As an alternative to the accelerator - steering finger 4 shown, a regulating wheel, a sliding element or a pressure sensor element may also be integrated into the steering control stick 1 as a functionally identical finger-actuable regulating part.

As can be seen from Figure 2, moreover, a Tempomat activation button 6, as a result of the actuation of which a speed-regulating device present in the vehicle can be activated and deactivated, is integrated into the steering control stick 1.

Figure 3 shows a foot-actuable regulating part in the form of a large-area force sensor element 7 which forms that component of the operating element arrangement for controlling the longitudinal and transverse movements of the motor vehicle by means of which braking operations are controlled. The force sensor element 7 is located in the

driver's seat floor region in front of a driver's seat [not shown] in the obliquely ascending portion 8a of a floor panel 8. Whilst the finger-actuable accelerator steering finger 4 replaces a conventional accelerator pedal, the force sensor element 7 takes the place of a conventional brake pedal. Pedal-related risks of injury are therefore ruled out, and the large-area force sensor element 7 can easily be actuated by the driver with one 9 of his feet. The strict spatial separation of the brake control by foot actuation, on the one hand, and the acceleration control by finger actuation, on the other hand, prevents an inadvertent activation of an acceleration operation instead of a braking operation with great reliability. The control unit [not shown] belonging to the operating element arrangement converts the actuating force exerted by the foot 9 on the force sensor element 7 into a corresponding activation of the vehicle brake system.

If required, a steering control stick according to Figures 1 and 2 may be provided on each side of the driver's seat. These are then coupled to the associated control unit in such a way as to enable the driver to drive the vehicle alternately with the right hand, the left hand or both hands, suitable measures being taken to avoid command collisions.

It becomes clear from the example shown and described that the operating element arrangement according to the invention makes it possible to drive the vehicle comfortably with a large amount of free space in the region of the driver's seat as a result of the omission of a steering wheel and an accelerator pedal. The brake pedal may be retained or preferably be replaced by the large-area force sensor element shown. For the foot-actuable regulating part for controlling braking operations, a passive, isometric or active design is possible in the same way as for the steering control stick and the finger-actuable regulating part.

Claims

1. An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, with a foot-actuable regulating part for the control of braking operations, the arrangement including a manually actuably arranged regulating part in the form of a steering control stick which, for controlling the transverse movement of the vehicle, can be subjected to actuating forces acting in the transverse direction of the vehicle and into which a finger-actuable regulating part for controlling acceleration operations is integrated.

2. An operating element arrangement according to Claim 1, wherein the manually actuable steering control stick is arranged to the side of a driver's seat.

3. An operating element arrangement according to Claim 1 or 2, wherein the finger-actuable regulating part comprises a regulating lever, regulating wheel, sliding element or pressure sensor element.

4. An operating element arrangement according to any one of Claims 1 to 3, wherein a large-area force sensor element, which is arranged in the front, driver's seat floor region, serves as a foot-actuable regulating part.

5. An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, substantially as described herein with reference to, and as illustrated in, the accompanying drawings.

The Patent Office

Application No:	GB 9713441.5	**Examiner:**	Robert Crowshaw
Claims searched:	1 to 5	**Date of search:**	17 September 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): F2Y (YCB, YCC, TCE, YCL, YTA, YTB)

Int Cl (Ed.6): A61F 4/00; B62D 1/02, 1/12, 1/22; G05G 1/14, 1/20, 9/00, 9/02, 9/04, 9/047; G06K 11/18

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2295662 A	(CHAN) Note page 5 lines 27-31, and in figure 1 the joystick 2 suitable for controlling vehicle steering upon which is located a trigger 50 suitable for controlling vehicle acceleration operations.	1, 3
X	WO 91/06903 A1	(CATERPILLAR) Note the vehicle steering control mechanism 10 upon which is located a switch 88 for controlling transmission speed.	1, 2, 3
X	WO 88/09279 A1	(SAAB-SCANIA) See especially page 17 lines 9-22, claim 27, and note the speed control knobs 65 mounted on the steering control sticks 5,6 in figures 1 and 11.	1, 2, 3

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.